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ABSTRACT

The Macquarie University (Australia) vision is to provide flexible learning options for all students. This will involve the dual development of resource-based curricula and information technology (IT) capacity across the university. This paper highlights major issues underpinning the design, development, and delivery of flexible learning and how these relate to the Macquarie context. An IT-based developmental model that accommodates curriculum redesign and the wider institutional changes needed to ensure the delivery of high-quality flexible learning is introduced. The model has the following characteristics: recognizes that flexible learning is underpinned by resource-based curriculum design; recognizes that the World Wide Web is pivotal in coordinating and managing flexible learning programs; recognizes that a variety of other media will also be used, depending on the teaching context; emphasizes the active involvement of participants in design, development, implementation, evaluation, and maintenance of resources and programs; accommodates the need to develop institutional capacity to support flexible learning; recognizes that institutional capacity requires coordination at all operational levels; and provides a practical context within which to develop, evaluate, and refine products, supporting policies, strategies, and technical, administrative, and managerial structures. A table outlines the three stages of the model (developmental, partial flexibility, full flexibility) as they relate to usage, access, resources, and strategic issues. (Author/DLS)

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Introducing Flexibility into Educational Programs: The Macquarie University Experience

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Abstract: Macquarie University's vision is to provide flexible learning options for all students. This will involve the dual development of resource-based curricula and information technology (IT) capacity across the University. This paper highlights major issues underpinning the design, development and delivery of flexible learning and how these relate to the Macquarie context. It introduces a three-stage IT-based developmental model which accommodates both curriculum redesign and the wider institutional changes needed to ensure the delivery of high-quality flexible learning.

1. Introduction

Flexible learning embodies the principles of student-centred education by catering for individual needs in a mass higher education system that is expanding to accommodate an increasingly diverse student body. Flexible learning can provide students with real choices in when, where, how and what to study. Flexibility can be introduced in several ways. Flexibility in *time* allows students to study when it is most convenient to them, rather than being restricted to a set schedule of classes. Flexibility in *place* allows students to choose the location of study; learning materials can be accessed from different locations, either on-campus or off-campus at home, work or even the local library. Provision of a range of different learning resources and teaching methods allows students to choose *what* or *how* to study. Lastly, flexibility in *pace* allows students to progress through an individual course unit or a whole program of study at their own speed to match their own circumstances.

The vision for flexible learning at Macquarie University is to provide flexible learning options for all students. This paper highlights major issues underpinning the design, development and delivery of flexible learning and how these relate to the Macquarie University context. It introduces a three-stage IT-based developmental model which accommodates both curriculum redesign and the wider institutional changes that are required to ensure the delivery of high-quality flexible learning options.

2. Flexible Learning: The Macquarie University Context

Australian higher education has experienced major change since the early 1980s, with increasing student numbers, closer alignment to national political objectives, increasing government control, growing emphasis on 'quality' and 'value for money', organisational restructuring affecting all levels from system-wide to individual departments, and accelerating moves to recover costs from individual students. Policies introduced by the current Federal Government have encouraged competition between universities, with their growing differentiation an emerging outcome [Rich et al. 1997]. Among its responses to this increasingly challenging environment, Macquarie University has developed a Flexible Learning Plan, which is not only an attempt to respond to changing patterns of student demand but also reflects evolving conceptions of student learning.

Limited flexible learning opportunities have long been available to some students through a well-established distance education (external) program offered for some, but not all courses. This program runs in parallel with on-campus (internal) programs but is administratively distinct. Historically, students were required to enrol in one or the other; it was not possible to combine elements from the distance and internal programs. Students could not, for example, receive instructional resources available to distance students and

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also formally enrol in on-campus tutorials or laboratory groups designed for internal students. This limited flexibility of study patterns and restricted use of learning resource materials to those students who chose to enrol in the distance program. Demand for more flexible options now, however, goes beyond this group. Although the distance program was established to provide education for non-metropolitan students, it is increasingly used by local students who, for family, career and other reasons have difficulty in accommodating on-campus class schedules. Administrative and educational distinctions between the two groups have gradually been eroded. All students, not just the traditional distance education group, are now potential users of flexible learning programs.

Pedagogically the content of distance and on-campus programs is usually similar, but the learning experiences are varied. In some units of study, there is little distinction between learning resources and teaching methods, while in others they can be very different. On-campus students generally attend lectures, tutorials, seminars and laboratory sessions. Although traditionalists consider the skills of academic discourse are best learned through small-group discussions, Bates [1995] challenges the reality of this, claiming that small-group face-to-face interaction is quite rare in post-secondary education today. For both on-campus and distance students, by far the largest part of their study is done alone, interacting with books and other media. The difference is that for distance students this fact is acknowledged and learning resources are designed to provide opportunities for interaction.

Distance programs typically employ a resource-based approach to curriculum design [NBEET 1994] which uses teaching and learning strategies based on instructional resource materials designed so that study is largely independent of real-time contact with staff. Numerous technologies are available to deliver resources including printed matter, audio and videotape, computer-based learning applications, interactive video (disk and tape), audio- or videoconferencing, broadcast TV and radio, and computer-mediated communications. At Macquarie, however, instructional resources are still primarily delivered using the early technologies of print, audio and video. Little use has been made of newer multimedia, Internet and computer-mediated communications. Taking this into account, along with Bates' observations, we can surmise that upgrading instructional resources in the distance program and the use of such resources in internal programs can benefit all students.

Individual interaction with instructional materials, while crucial to the learning process, is only one element contributing to the complexity of learning and understanding. Cognitive development is strongly linked to input from others. Interaction among learners as well as between learners and teachers, whether through conversation or collaborative exercises, is an important strategy that should be embedded in any teaching program [Slavin 1997]. On-campus students have usually had more opportunities for communication between staff and students, both individually and in groups, than have distance students. However, modern communications technologies provide new ways for learners to interact at both a personal and instructional level that can partially equalise these opportunities. The selective and effective use of electronic collaborative learning exercises, virtual tutorials, bulletin boards and individual email conversations between staff and students has been shown to produce learning benefits [Katz & Lesgold 1993]. This provides, as never before, the opportunity to break down the barriers and isolation that many distance students experience. Likewise, in an environment of rising student:staff ratios and increasing class sizes, on-campus students could well benefit from these new avenues of communication.

The emerging reality is that it is now possible to provide similar learning experiences for on-campus and distance students by using instructional resources that exploit the interactive and communications capacity of modern technology. Incorporation of such resources into curriculum design not only facilitates the convergence of educational programs but, according to advocates, can produce other strategic and educational benefits. Well designed instructional materials can make students more active and independent learners; provide safety nets for students who are falling by the wayside in the more traditional mode of teaching; offer economies of scale where student numbers are large; reduce unproductive travelling time for part-time students; cater for student diversity; reduce pressure on teaching staff; and ease overcrowding of teaching space [NBEET 1994; Brown 1997].

The Macquarie University vision of flexible learning is to capitalise on these benefits to provide flexible learning options for all students, not just those enrolled in distance education programs. It aims to provide more choices by bridging the gap between on and off-campus students through the provision of similar curricula and learning experiences for both groups. In effect, this will result in a convergence of distance and internal programs which, for all intents and purposes, will mean academic staff will be teaching one program.

not two. The benefits for students are threefold: on-campus students will have access to the comprehensive resources currently available to distance students; off-campus students will have greater opportunities to communicate and collaborate with staff and the entire student cohort; and most importantly all students will have the choice of studying either on or off-campus or a combination of both, according to their individual needs at a given time.

3. The Introduction of Flexible Options into Educational Programs

3.1 Design Issues

Underpinning the design of flexible learning options is the curriculum design concept of resource-based learning. The enabling factor making it possible to use different resources in flexible ways is IT and its capacity to access information, deliver content and facilitate communication. Consequently, IT in general and the World Wide Web in particular have a pivotal role in the design and development of curriculum materials as well as in the delivery and management of flexible programs. At its simplest, the Web can be used to coordinate, and manage the learning experience through the provision of course outlines, teaching schedules, news bulletins and communication facilities. At its most sophisticated, the Web can provide a virtual learning environment that: handles enrolments; disseminates administrative information such as course outlines and teaching schedules; records student progress; delivers content and supports interactivity; facilitates communication and collaborative learning; provides assessment and feedback to students; and administers student evaluations of teaching.

Within the foreseeable future, a unit of study with flexible learning options would have a range of learning options equally accessible from on and off-campus. A Web interface would manage learning by providing course information, suggested scheduling of the content to be covered and the learning resources and interactive opportunities available to students. Specific resources may be delivered through the Web or may be in print, CD-ROM or disk format. A mixture of on and off-campus activities could be available; for example, students could choose between a face-to-face seminar session or an electronic discussion group; live lectures may be available or alternatively videoconferencing or audiotapes could be accessed. Other resources could include electronic quizzes, computer-based learning packages, simulations, group learning exercise and textbooks. Communication between participants could be facilitated through the Web using email, bulletin boards, conferencing options or, for students on campus, consultation hours could be available. Assignments could be submitted, marked and returned on-line. The role of the teacher would change from that of an expert delivering information and knowledge to one of an expert coordinating and managing a range of learning opportunities. Students would no longer be classified as internal or distance with restrictions on study options but would select from a range of learning resources or events, whether on-campus, off-campus or a combination of both.

3.2 Developmental Issues

Developing flexible learning options, as well as enhancing existing offerings, will require time, resources and energy. For students and staff it will be a new experience and infrastructure and support facilities will need to be developed to accommodate the change. From an educational perspective, the change will require the dual development of a resource-based curriculum and IT capacity. The term IT capacity is used in this context as an all encompassing term including physical infrastructure such as networks, hardware and software, and the technical skills and knowledge required to design, develop, implement and manage IT-based teaching resources as well as the supporting technical systems.

Neither curriculum expertise nor IT capacity, especially the ability to integrate new technologies into teaching programs, is evenly distributed across Macquarie University. This is not unusual in the Australian higher education system as evidenced by a recent study of the expected adoption of computer-mediated communication in university teaching which revealed that "there was little evidence of a consistent move towards an informed use of new technologies for teaching, with most developments being related to individual enthusiasts or small groups with expertise" [Hesketh et al. 1996]. Consequently, any institution-wide move

towards introducing flexible options must be coupled with the development and maintenance of the necessary human, physical and technical resources. A recent report on Quality in Resource Based Learning [NBEET 1997] identified these as including: the design and development of instructional resources, with more emphasis needing to be placed on instructional design to ensure there is a focus on active student-centred approaches and recognition of cultural and educational diversity; the development and maintenance of technical infrastructure; staff development to ensure confident and committed staff with new competencies; sustained and committed leadership; informed planning and management of resources; the provision of effective and efficient administration systems and services; support for learners; provision of adequate access for all clients; evaluation mechanisms to ensure continuous improvement; and new benchmarks for accrediting courses.

4. A Web-based Model for Introducing Flexibility

4.1 The Model

The Centre for Flexible Learning at Macquarie University has developed a three-stage model to facilitate the introduction of flexibility (Tab. 1). This Web-based model guides the development of on-line study programs within a framework that accommodates the institutional developments listed above. The model:

- recognises that flexible learning is underpinned by resource-based curriculum design;
- recognises that the Web is pivotal in coordinating and managing flexible learning programs;
- recognises that a variety of other media will also be used, depending on the particular teaching context;
- emphasises the active involvement of participants in the design, development, implementation, evaluation and maintenance of resources and programs;
- recognises and accommodates the need to develop institutional capacity to support flexible learning;
- recognises that institutional capacity requires coordination at all operational levels; and
- provides a practical context within which to develop, evaluate and refine products, supporting policies, strategies, and technical, administrative and managerial structures.

4.1 Stage 1: Developmental

Stage 1 is largely a developmental phase to orient staff and students to an on-line environment and to develop the structural mechanisms, skills, curriculum content and administrative procedures needed to deliver education through the Web. It commonly involves maintaining an existing curriculum structure and teaching resources but developing a homepage for the course unit or program involved, as a supplementary, not compulsory, resource. It might provide some or all of the following: administrative information, curriculum outlines, assessment requirements, lists of additional learning resources, a bulletin board or links to Internet sites, professional bodies or special interest groups. Initially, open (public) access to the homepage is recommended.

The Stage 1 homepage serves several purposes. It orients students to using the Web as a communication and information resource. For staff members and departments, homepage construction requires involvement in the development process and is an opportunity to gain an understanding of the scope and nature of the changes needed to accommodate Web-based teaching. Most importantly, this concrete experience is a basis for developing, evaluating and refining policies and strategies to deal with curriculum and management issues associated with resource development; technical, physical and human infrastructure support; access and equity issues in regard to computer ownership and Internet access; support and training for students; and staff development.

4.2 Stage 2: Partial Flexibility

In Stage 2 computer use becomes compulsory for at least one component of study, so that all access and equity arrangements, technical infrastructure, and student and staff support mechanisms must be operational. Typically, as knowledge and skills grow in Stage 1, new learning resources are developed using the Web environment's special features to cater for both on and off-campus students. Such resources may include

compilations of relevant Internet links, quizzes, simulations, computer-based learning programs, practice exercises with hints and feedback, gateways into research or commercial databases, and communications facilities such as email, listservs and bulletin boards that can facilitate collaborative learning or individual communication. In Stage 2, the range of such resources often increases and they are fully integrated into the curriculum.

Only when the transition to compulsory computer use has been made can staff and students critically evaluate the initiatives. This stage can thus be seen as the trialing phase, which provides the opportunity to evaluate and refine resources, policies and procedures. At the same time there should be ongoing infrastructure, staff and resource development taking place. The internal and external curricula should be subject to continual review and restructuring with the aim of convergence to a common curriculum. It is often desirable to protect the increasingly valuable intellectual property embodied in the learning resources by a system of password protection, making them available only to enrolled students; as in Stage 1, organisational material and any content likely to promote the course unit or the University can be left available to the public.

4.3 Stage 3: Full Flexibility

Stage 3 is typically reached when there is sufficient confidence in the curriculum resources, access arrangements, technical capability and support structures to offer the program with full web-enhanced flexibility, although the transition from Stage 2 is not always clear-cut. Computer use is compulsory from either on or off-campus and again it may be desirable to password-protect key learning resources. The entire program of study is available flexibly to all students and is managed on-line. It is important to reiterate, however, that full flexibility does not imply that all components of teaching and learning are delivered through the Web. Rather, it is used to create a virtual learning environment which acts as a point of communication to coordinate and manage the learning experience which is provided through a range of resources in several different media.

	Stage 1: Developmental	**Stage 2: Selective Flexibility**	**Stage 3: Full Flexibility**
Usage	Development of supplementary learning resources. Optional use.	Partially on-line. Incorporates some Web components. Compulsory use of some components.	On-line delivery and management of the unit. Compulsory use for the entire unit.
Access	Open access.	Differential access. Open access for administrative information and restricted for learning materials.	Differential access. Open access for administrative information and restricted for learning materials.
Resources	Homepage as an additional source of information for the students and the community: • general information about the course unit • content outlines • links to Internet resources, professional bodies etc. • email links/request forms	Some components of the unit are on-line, eg: • Internet resources • quizzes • simulations • computer-based learning • practical exercises • group discussion • interfaces to databases	The entire unit is flexible. Stage 2 resources plus additional Web use; eg: • management of learning • content delivery • interaction with content • collaborative learning • assessment • evaluation
Strategic Issues	Development of policies, strategies and support mechanisms. Staff development.	Evaluation and refinement of policies, strategies and support mechanisms. On-going staff development.	All policies, procedures and systems in place and operational.

Table 1: An IT-based model for introducing flexible learning into the curriculum

5. Using the Model

Sequential progression through stages is particularly useful for programs with little or no expertise in the Web or in computer-based teaching. Most activity at Macquarie University is still at Stage 1 where expertise is being developed or Stage 2 with partial flexibility. While the University has flexible offerings in the form of traditional distance education programs, very few are operating at Stage 3 of the IT-based model with on-line management and coordination of students' learning. For Schools with existing learning resources, the conversion to full flexibility is often a process of integrating those resources and management systems within a Web-based environment: essentially a movement from Stage 2 to Stage 3.

The first programs to offer full Stage 3 Web-based flexibility followed this approach. Emerging from the School of Earth Sciences, the flagship was a first-year unit, GEOS114 *Global Environmental Crises* [Earth Sciences 1997; Rich et al. 1997] catering for 400-500 students. Before the emergence of the Web, a resource-based curriculum akin to Stage 2 was developed employing a computer-based multiple-choice quiz (available on-campus only), an interactive CD-ROM, a textbook and live or audiotaped lectures. The unit moved to Stage 3 and full flexibility with the development of a Web interface to guide study patterns, manage the use of learning resources and integrate communications facilities. New IT-based resources were developed, including an Internet Resources kit and two interactive learning programs. Alongside these, lectures and print materials are still used.

For existing distance education programs running parallel with internal programs one pathway to Stage 3 flexibility is to initially retain existing materials, but merge the programs by developing a Stage 1 Web presence to serve both, introduce computer-mediated communications and gradually develop new resources accessible on or off-campus. An example is a first-year law unit, LAW113 *Jurisprudence Law* [Law 1998]. A Website supports both on-campus and distance students; course unit content is identical for all students but different instructional options are available, for example a choice of lectures or audiotapes. A key feature is the ability to use structured and unstructured discussions via email and bulletin boards as an alternative to on-campus seminars. The program has currently reached Stage 2. While trialing and evaluation are taking place, a safety net for distance students without computer access is operating through the availability of traditional on-campus block teaching sessions. Once development and strategic issues identified in the model are resolved, Stage 3 flexibility can become a reality. At this stage, all students will be required to have computer access to enrol in the unit.

These are two of many examples of how the model is being applied, both representing initial units of degree courses. Both evolved from supportive foundations: strong IT capacity in one case and an existing distance program in the other. A major challenge lies in developing flexibility where neither of these foundations exists. In such a context, the three-stage model provides a framework to guide the sequential development of flexible learning, as an alternative to what can otherwise seem the insurmountable hurdle of achieving full flexibility.

6. Concluding Comments

The three-stage model is powerful because it actively involves staff in the development process; it accommodates different teaching contexts and levels of design and technical expertise; and it provides a framework for staff development, and for policies and strategies to develop IT infrastructure. Introduction of flexible learning into the curriculum will, for some, involve workplace changes as well as adjustments of personal philosophies of teaching and learning. The staged approach provides the time and space necessary to deal with such structural and developmental issues as well as the political and cultural factors that accompany any major change. Most importantly, the model can provide a means to move the University towards its goal of being an exemplary provider of modern education based on research, innovative teaching and flexible delivery.

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